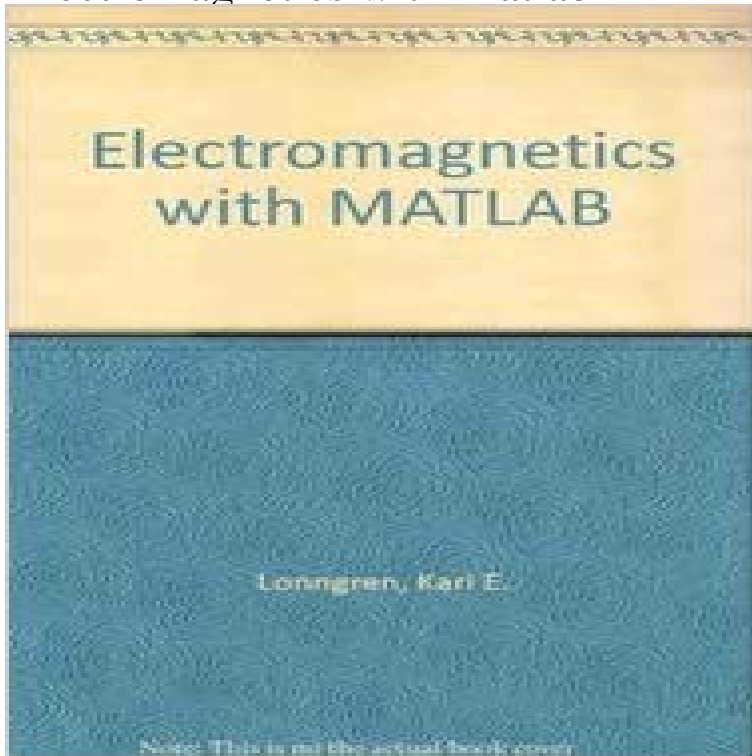


Electromagnetics with Matlab



The underlying philosophy of this one semester undergraduate text shall be to take this seemingly abstract material and make it understandable and interesting to the student. In this text, a brief review of vectors will be initially given in Chapter 1 so the student is comfortable with the notation in the text and has an intuitive grasp of the gradient, divergence and curl operations along with the divergence and Stokes theorems. Generalized coordinates are used since the resulting derivations follow more naturally. Static electric and magnetic fields are reviewed in Chapter 2. This review makes use of the knowledge that was gained in the introductory physics courses. Chapter 3 introduces various mathematical and numerical techniques that are frequently employed to solve problems in electromagnetics. This includes an introduction to the method of separation of variables. Since most electrical and computer engineering students possess a degree of computer literacy and usually have access to personal or larger computers in their education today, these techniques can be employed throughout the course. In this text, we emphasize the use of MATLAB owing to its wide availability in educational institutions and its ease of use. Students usually have also encountered MATLAB in other courses so the learning curve for this useful tool is not very steep. Several programs that can be directly used or easily modified are included throughout the text. Chapter 4 of the text develops Maxwells equations, Poyntings theorem, and the boundary conditions. Electromagnetic waves follow in Chapter 5. An extended description of the concept of waves using intuitive physical examples precedes the discussion ofelectromagnetic waves. The multiple reflection of two plane electromagnetic waves between two infinite parallel conducting surfaces introduces the topic of waveguides. The

propagation of electromagnetic waves is also described in Chapter 6 where transmission lines are discussed. Circuit models are employed so the student can expand upon the abilities that have already been gained in previous courses in circuit theory. In addition, we show how the control systems subprogram SIMULINK which is a part of MATLAB can be used to perform experiments on the transmission line model. The radiation of electromagnetic waves from first principals is discussed in Chapter 7. Important parameters of antennas are introduced also in this chapter.

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